

WHAT IS CLAIMED IS:

1. An apparatus for producing and supplying water-in-oil emulsified fuel, comprising:

an additive storage tank for storing an emulsifier that prevents the separation of water and oil when maintaining water-in-oil emulsified fuel at a high temperature;

an emulsion tank for storing water-in-oil emulsified fuel and supplying the same to a boiler from a center side area through a boiler supply line;

a circulation electric heater mounted to one side within the emulsion tank to uniformly maintain a temperature of the supplied water-in-oil emulsified fuel;

a level switch mounted to the emulsion tank to adjust a storage amount of the water-in-oil emulsified fuel, which is established to match a usage load of the boiler;

an additive supply pump connected to the additive storage tank supplying at a predetermined amount the emulsifier stored therein to allow for mixing of the emulsifier with water and B-C oil;

an additive flow meter connected to the additive supply pump and controlling an operation of the same such that the emulsifier is supplied by a predetermined supply amount;

a B-C oil supply pump supplying B-C oil by a predetermined amount for mixing with water and an emulsifier;

a B-C oil flow meter connected to the B-C oil supply pump and controlling an operation of the same such that the B-C oil is supplied by a predetermined supply amount;

a first mixer connected both to an additive supply line that is connected to the additive flow meter and to a B-C oil supply line that is connected to the B-C oil flow meter, the first mixer mixing the B-C oil and the emulsifier;

a water cutoff valve supplying water by a predetermined amount for

mixing with the B-C oil and the emulsifier;

a water flow meter connected to the water cutoff valve and controlling an operation of the same such that water is supplied by a predetermined supply amount;

5 a mixing ejector connected both to a water supply line, which is connected to the water flow meter, and to the first mixer, the mixing ejector primarily uniformly mixing a raw material oil of the B-C oil and the emulsifier, and discharging a resulting mixture;

10 a mixer pump connected to the mixing ejector and a lower end of the emulsion tank for re-mixing the raw material oil supplied from the mixing ejector and the emulsified fuel supplied from the emulsion tank; and

a second mixer connected to the mixer pump for remixing the primarily mixed raw material oil and the emulsified fuel to uniformly emulsify a resulting mixture to uniform minute particles, then supplying a result to the emulsion tank through the circulation electric heater,

15 wherein the additive supply pump, the B-C oil supply pump, the water cutoff valve, the additive flow meter, the B-C oil flow meter, and the water flow meter operate when a LOW signal of the level switch of the emulsion tank is transmitted, the additive flow pump, the B-C oil supply, and the water cutoff valve, to which are connected respectively the additive flow meter, the B-C oil flow meter, and the water flow meter, discontinuing operation according to a discontinue signal transmitted when predetermined values of these flow meters are reached, and

25 wherein following the supply of a predetermined amount of the raw materials, emulsified fuel mixed in a circulation system of the emulsion tank, the mixer pump, the second mixer, and the circulation electric heater is continuously circulated even if raw material supply is stopped such that emulsified fuel that is always in a uniform state is supplied while maintaining a predetermined ratio, a predetermined moisture particle state, and a predetermined temperature.

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2. The apparatus of claim 1, further comprising a steam coil mounted to an inner surface of the additive storage tank for maintaining the emulsifier stored therein at a predetermined temperature.

5 3. The apparatus of claim 2, wherein the steam coil maintains the emulsifier stored in the additive storage tank at a temperature of 60 ~ 110 °C.

4. The apparatus of claim 1, further comprising an electric heater mounted to a lower output side of the additive storage tank for uniformly maintaining the emulsifier exiting the additive storage tank at a predetermined temperature such that stable additive supply is ensured during initial operation.

5. The apparatus of claim 4, wherein the electric heater maintains the emulsifier stored in the additive storage tank at a temperature of 60 ~ 110 °C.

6. The apparatus of claim 1, wherein the capacity of the emulsion tank is at least two batches of a raw material supply amount.

7. The apparatus of claim 1, further comprising a temperature retaining electric heater mounted to an exterior of the emulsion tank to maintain a temperature of the water-in-oil emulsified fuel stored in the emulsion tank at a predetermined level.

8. The apparatus of claim 7, wherein the temperature retaining electric heater maintains the water-in-oil emulsified fuel stored in the emulsion tank at a temperature of 60 ~ 80 °C.

9. The apparatus of claim 1, wherein the circulation electric heater maintains the water-in-oil emulsified fuel supplied to the emulsion tank at a temperature of 60 ~ 80 °C.

10. The apparatus of claim 1, wherein the additive supply pump supplies an emulsifier at a fixed ratio of 0.5 ~ 1% of the first batch raw material supply amount.

11. The apparatus of claim 1, wherein the B-C supply pump supplies

B-C oil at a fixed ratio of 69.5~89.5% of the first batch raw material supply amount.

12. The apparatus of claim 1, wherein the water cutoff valve supplies water at a fixed ratio of 10~30% of the first batch raw material supply amount.

13. The apparatus of claim 1, wherein the first mixer is a single-type line mixer.

14. The apparatus of claim 1, wherein the second mixer is a double-type line mixer.

15. The apparatus of claim 1, wherein the mixer pump includes a pre-mixer pump and a main mixer pump, which are connected in parallel between the emulsion tank and the second mixer.

16. The apparatus of claim 1, wherein a shell and tube heat exchanger is used for the circulation electric heater.

17. An apparatus for producing and supplying water-in-oil emulsified fuel, comprising:

an additive storage tank for storing an emulsifier that prevents the separation of water and oil when maintaining water-in-oil emulsified fuel at a high temperature;

an emulsion tank having a capacity of at least a first batch raw material supply amount, and storing and mixing water-in-oil emulsified fuel;

a circulation electric heater mounted to one side within the emulsion tank to uniformly maintain a temperature of the supplied water-in-oil emulsified fuel;

a level switch mounted to the emulsion tank to adjust a storage amount of the water-in-oil emulsified fuel, which is established to match a usage load of the boiler;

a service tank receiving mixed water-in-oil emulsified fuel from the emulsion tank through an emulsified fuel transporting pump, which is connected to a lower end of the emulsion tank, temporarily storing the

received water-in-oil emulsified fuel, and supplying the water-in-oil emulsified fuel to the boiler through a boiler supply line connected to a bottom end of the service tank;

an additive supply pump connected to the additive storage tank and
5 supplying at a predetermined amount the emulsifier stored therein to allow for mixing of the emulsifier with water and B-C oil;

an additive flow meter connected to the additive supply pump and controlling an operation of the same such that the emulsifier is supplied by a predetermined supply amount;

10 a B-C oil supply pump supplying B-C oil by a predetermined amount for mixing with water and an emulsifier;

a B-C oil flow meter connected to the B-C oil supply pump and controlling an operation of the same such that the B-C oil is supplied by a predetermined supply amount;

15 a first mixer connected both to an additive supply line that is connected to the additive flow meter and to a B-C oil supply line that is connected to the B-C oil flow meter, the first mixer mixing the B-C oil and the emulsifier;

a water cutoff valve supplying water by a predetermined amount for
20 mixing with the B-C oil and the emulsifier;

a water flow meter connected to the water cutoff valve and controlling an operation of the same such that water is supplied by a predetermined supply amount;

25 a mixing ejector connected both to a water supply line, which is connected to the water flow meter, and to the first mixer, the mixing ejector primarily uniformly mixing a raw material oil of the B-C oil and the emulsifier, and discharging a resulting mixture;

30 a mixer pump connected to the mixing ejector and a lower end of the emulsion tank for re-mixing the raw material oil supplied from the mixing ejector and the emulsified fuel supplied from the emulsion tank; and

a second mixer connected to the mixer pump for remixing the primarily mixed raw material oil and the emulsified fuel to uniformly emulsify a resulting mixture to uniform minute particles, then supplying a result to the emulsion tank through the circulation electric heater,

5 wherein the additive supply pump, the B-C oil supply pump, the water cutoff valve, the additive flow meter, the B-C oil flow meter, and the water flow meter operate when a LOW signal of the level switch of the emulsion tank is transmitted, the additive flow pump, the B-C oil supply, and the water cutoff valve, to which are connected respectively the additive flow
10 meter, the B-C oil flow meter, and the water flow meter, discontinuing operation according to a discontinue signal transmitted when predetermined values of these flow meters are reached, and

 wherein following the supply of a predetermined amount of the raw materials, emulsified fuel mixed in a circulation system of the emulsion tank,
15 the mixer pump, the second mixer, and the circulation electric heater is continuously circulated even if raw material supply is stopped such that emulsified fuel that is always in a uniform state is supplied while maintaining a predetermined ratio, a predetermined moisture particle state, and a predetermined temperature.

20 18. The apparatus of claim 17, wherein the first mixer is a single-type line mixer, and the second mixer is a double-type mixer.

 19. The apparatus of claim 17, further comprising a level switch mounted in the service tank to allow for adjustment of the amount of the water-in-oil emulsified fuel, which is established to correspond to a usage
25 load of the boiler, and the emulsified fuel transporting pump operates when a LOW signal of the level switch of the service tank is sensed, and discontinues operation when a LOW signal of a level switch of the emulsion tank is sensed.

 20. The apparatus of claim 17, further comprising a temperature
30 retaining electric heater mounted to an outer circumference of the service

tank such that the temperature of the water-in-oil emulsified fuel stored therein may be maintained at a predetermined temperature.

21. An apparatus for producing and supplying water-in-oil emulsified fuel, comprising:

5 an additive storage tank for storing an emulsifier that prevents the separation of water and oil when maintaining water-in-oil emulsified fuel at a high temperature;

 an emulsion tank for storing water-in-oil emulsified fuel and supplying the same to a boiler from a center side area through a boiler supply line;

10 a level switch mounted to the emulsion tank to adjust a storage amount of the water-in-oil emulsified fuel, which is established to match a usage load of the boiler;

 an additive supply pump connected to the additive storage tank supplying at a predetermined amount the emulsifier stored therein to allow
15 for mixing of the emulsifier with water and B-C oil;

 an additive flow meter connected to the additive supply pump and controlling an operation of the same such that the emulsifier is supplied by a predetermined supply amount;

 a B-C oil supply pump supplying B-C oil by a predetermined amount
20 for mixing with water and an emulsifier;

 a B-C oil flow meter connected to the B-C oil supply pump and controlling an operation of the same such that the B-C oil is supplied by a predetermined supply amount;

 a first mixer connected both to an additive supply line that is
25 connected to the additive flow meter and to a B-C oil supply line that is connected to the B-C oil flow meter, the first mixer mixing the B-C oil and the emulsifier;

 a water cutoff valve supplying water by a predetermined amount for mixing with the B-C oil and the emulsifier;

30 a water flow meter connected to the water cutoff valve and

controlling an operation of the same such that water is supplied by a predetermined supply amount;

a second mixer connected to a water supply line that is connected to the water flow meter and connected to the first mixer to primarily uniformly mix water in raw material oil of the B-C oil and the emulsifier;

a mixer pump connected to the second mixer and a lower end of the emulsion tank to remix raw material oil supplied from the second mixer and the emulsified fuel supplied from the emulsion tank;

a circulation electric heater connected to the mixer pump for uniformly maintaining mixed raw material oil supplied therefrom at a predetermined temperature; and

a third mixer connected to the circulation electric heater for mixing raw material oil supplied therefrom and the emulsified fuel to uniformly emulsify a resulting mixture to uniform minute particles, then supplying a result to the emulsion tank,

wherein the additive supply pump, the B-C oil supply pump, the water cutoff valve, the additive flow meter, the B-C oil flow meter, and the water flow meter operate when a LOW signal of the level switch of the emulsion tank is transmitted, the additive flow pump, the B-C oil supply pump, and the water cutoff valve, to which are connected respectively the additive flow meter, the B-C oil flow meter, and the water flow meter, discontinuing operation according to a discontinue signal transmitted when predetermined values of these flow meters are reached, and

wherein following the supply of a predetermined amount of the raw materials, emulsified fuel mixed in a circulation system of the emulsion tank, the mixer pump, the circulation electric heater, and the third mixer is continuously circulated even if raw material supply is stopped such that emulsified fuel that is always in a uniform state is supplied while maintaining a predetermined ratio, a predetermined moisture particle state, and a predetermined temperature.

22. The apparatus of claim 21, wherein the first mixer and the second mixer are single-type mixers, and the third mixer is a double-type mixer.

23. An apparatus for producing and supplying water-in-oil emulsified fuel, comprising:

an additive storage tank for storing an emulsifier that prevents the separation of water and oil when maintaining water-in-oil emulsified fuel at a high temperature;

an emulsion tank having a capacity of at least a second batch raw material supply amount, and storing and mixing water-in-oil emulsified fuel;

a level switch mounted to the emulsion tank to adjust a storage amount of the water-in-oil emulsified fuel, which is established to match a usage load of a boiler;

an additive supply pump connected to the additive storage tank supplying at a predetermined amount the emulsifier stored therein to allow for mixing of the emulsifier with water and B-C oil;

an additive flow meter connected to the additive supply pump and controlling an operation of the same such that the emulsifier is supplied by a predetermined supply amount;

a B-A oil supply pump supplying B-A oil by a predetermined amount for mixing with water and an emulsifier;

B-A oil flow meter connected to the B-A oil supply pump and controlling an operation of the same such that the B-A oil is supplied by a predetermined supply amount;

a first mixer connected both to an additive supply line that is connected to the additive flow meter and to a B-A oil supply line that is connected to the B-A oil flow meter, the first mixer mixing the B-A oil and the emulsifier;

a water cutoff valve supplying water by a predetermined amount for mixing with the B-A oil and the emulsifier;

a water flow meter connected to the water cutoff valve and controlling an operation of the same such that water is supplied by a predetermined supply amount;

5 a second mixer connected to a water supply line that is connected to the water flow meter and connected to the first mixer to primarily uniformly mix water in raw material oil of the B-A oil and the emulsifier;

a mixer pump connected to the second mixer and a lower end of the emulsion tank to remix raw material oil supplied from the second mixer and the emulsified fuel supplied from the emulsion tank; and

10 a third mixer connected to the mixer pump for mixing primarily mixed raw material oil supplied therefrom and the emulsified fuel to uniformly emulsify a resulting mixture to uniform minute particles, then supplying a result to the emulsion tank,

15 wherein the additive supply pump, the B-A oil supply pump, the water cutoff valve, the additive flow meter, the B-A oil flow meter, and the water flow meter operate when a LOW signal of the level switch of the emulsion tank is transmitted, the additive flow pump, the B-A oil supply pump, and the water cutoff valve, to which are connected respectively the additive flow meter, the B-A oil flow meter, and the water flow meter, discontinuing
20 operation according to a discontinue signal transmitted when predetermined values of these flow meters are reached, and

25 wherein following the supply of a predetermined amount of the raw materials, emulsified fuel mixed in a circulation system of the emulsion tank, the mixer pump, and the third mixer is continuously circulated even if raw material supply is stopped such that emulsified fuel that is always in a uniform state is supplied while maintaining a predetermined ratio, a predetermined moisture particle state, and a predetermined temperature.

30 24. The apparatus of claim 23, wherein a mixing ejector and a single-type mixer are both used for the first mixer and the second mixer, and a double-type mixer is used for the third mixer.